Hydroacoustic modelling applied in hydraulic components: a test rig based experiment

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Abstract

The exponential increase of computational power has allowed the development of numerical simulation methods. Numerical simulation is widely used in the industries at all stages of the product development process: the design support, comparison between several solutions, final validation. Virtual prototyping and optimization methods enable to meet requirements from the first physical prototype. Hydraulic power transmission, which can be considered as a mature technology providing an unrivalled specific power, is widespread for Off-Road and On-Road vehicles. Nevertheless, this kind of technology has two identified weaknesses which are energetic efficiency and noise generated during the operation. In such a context, the proposed research project focuses on the modelling, the analysis and the simulation for a component set constituting a hydraulic transmission taking into account the flow and pressure ripples. Thus, this work deals with the modelling of fluid borne noise applied to a hydrostatic transmission. From the state-of-the-art on hydroacoustic spread laws, the paper introduces an original method for the modelling of transition from frequency to temporal domain allowing an analysis of the unsteady behavior of hydraulic system. Then, this method is applied to characterize the hydroacoustic behavior of a rigid pipe using a simulation software. Finally, the used experimental means are presented, as well as a correlation between real measurement and computational analysis applied for a rigid pipe.

Key words: numerical engineering / fluid borne noise / hydroacoustic analysis / hydraulic power